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MEMORANDUM FOR: Mr. John J. Crowley

THROUGH: [REDACTED]

FROM: [REDACTED]

SUBJECT: The CORONA UTB Program

NRO review(s) completed.

REFERENCE: [REDACTED]

1. The technical recommendation provided by the Project Office that the UTB test program be abandoned has brought forth a number of loud screams from the Washington community who "are counting so heavily on its success". During the nearly five years since you and I began work on the CORONA Improvement Program most of the "players" in the game have changed and there are few people left who can commit to writing the events which have placed us in our present position. For the record, therefore, I have set about to do so for you.

2. The CORONA Improvement Program Proposal which you initiated and which you and I presented with the help of the contractors to the DNRO (Dr. McMillan) in June 1965 called for:

- a. Development of the constant rotator camera to provide for a capability of flying the system at altitudes below 100 nm.
- b. Improvement in V/H control, vibration, etc. to improve photographic quality.
- c. Incorporation of the Double Improved Stellar Index Camera (DISIC) to improve attitude determination and allow better use of the system by the mapping community.
- d. Development of the Mark VIII recovery capsule to provide a 300% increase in film recovery.
- e. On orbit lifetime extension to 30 days to allow efficient film utilization.

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- f. Use of the Atlas or Thorad senior booster to provide the required weight margin for the increased payload, and to allow for higher inclination orbits (i.e., 96°).

3. Our recommendations a, b and c were approved by the DNRO but d, e and f were rejected. The reason for rejection was primarily that Official Washington held the view at that time (July 1965) that:

- a. "the CORONA System was not film limited" and
- b. "it was preferable operationally to retain the launch rate of 12 systems per year than to increase the film capacity, increase mission life, and reduce the launch rate".

4. The Project Office began work on the J-3 Program with these assumptions. A design goal was added to the constant rotator camera development for the transport of Ultra Thin Base (UTB) film but this "design goal" was specifically not to interfere with the development or launch schedules for the J-3 System. A design feature which the Project Office wished to pursue was an oversized supply cassette which would have allowed for future growth potential of the system without costly modification and/or requalification. This design was carried from June to November but was dropped in November 1965 following the camera system PDR because of the severe system weight constraint which was imposed by the Thorad Castor II booster selection.

5. Almost two years after the initiation of the J-3 Program (May 1967) the Washington view on the film capacity requirement of the J-3 System changed [redacted] had in the meantime replaced [redacted] as Chief of the SOC). The Project Office was told in the spring of 1967 (after a meeting with [redacted] in your office) that it's test program with UTB must be expedited and that a full test flight must be scheduled at the earliest possible date. Accordingly, CR-5 was field retrofitted for UTB and Mission 1105 was flown with a full UTB load in November 1968. Although the complete film load of 24,000 feet was successfully transported, the post-flight evaluation of the imagery showed an extreme variability in camera focus and excessive smear throughout a large percentage of the photography.

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6. A UTB "task force" was organized as a result of Mission 1105, and a recommended test program was developed. The task force presented its findings in a report released in February 1969. A set of UTB modifications were developed by Itek as a result of the test program and these modifications were incorporated on CR-8 and all subsequent systems, and were qualified on CR-8 prior to its refurbishment in the fall of 1969.

7. Because of the difficulties with the UTB program both at Itek in Boston and in the field, the undersigned has consistently maintained that a backup of two STB systems should be maintained until after UTB is proven successful in flight. The undersigned also participated in the preparation of a Staff Memorandum for you in December 1968 which highlighted the UTB problems of the CORONA system [redacted] and which recommended the procurement of additional CORONA systems. This memorandum, I believe, you forwarded on to Mr. Duckett in early 1969. Both the recommendation on the number of STB backups and the procurement of additional systems were eventually killed, however, at upper management levels. The result of the former is that our reserve payload situation on CORONA is dangerously low. The failure to procure additional CORONA's places us now in a situation where failure on CORONA [redacted] such as the UTB test problems on CORONA) will result in a gap in photo reconnaissance coverage in 1971.

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8. A high risk, success oriented program has been followed by management this past year with regard [redacted] CORONA UTB effort. It appeared in January 1970 that the UTB gamble would pay off on CORONA and that the remaining CORONA systems could be satisfactorily flown with UTB. The technical presentations given to you, Dr. Naka, the SOC and COMIREX were factual and forthright at the time they were briefed. The facts have changed, however, in the past several weeks, and not only the technical personnel who find themselves trapped in the UTB circle of problems, but also the management personnel who have insisted upon the high risk approach to the problem should feel a sense of defeat in the current dilemma with UTB.

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9. To briefly summarize the present position of UTB in the CORONA program, we can state that problems exist on all three systems which are in test. There is no positive solution available for the tracking problems other than the film change from UTB to STB. There is a possibility that film tension could be reduced, (to the levels used with CR-5) but this condition would lead to a gross uncertainty in terms of predicted image quality. The amount of resolution loss due to defocus could well exceed the resolution loss which would occur from simply flying higher altitude orbits with STB. The resolution loss in the UTB case would be accompanied by a loss in system reliability and appears therefore a bad tradeoff.

10. There are several further system hardware modifications which could be considered to increase the probability of success with UTB. These include the design of a takeup servo, or the design of an isolated platen transport which would provide a different level of tension in the platen area from that found in the supply and take regions. Both servo designs would require lengthy R&D plus field retrofit and possible system requal. In no case could the modifications be accomplished prior to CR-15, which leaves only three systems affected. There is no absolute guarantee that even these modifications would be successful. The uncertainties associated with the UTB problems are coupled with a reduced availability of engineering talent on the program, the undesirability of doing modifications on systems at the field test site in the phaseout portion of the program, a lack of reserve payloads in the inventory, and the impact of the forthcoming move of the facility. Considering program reliability, I believe that the Project Office recommendation that the UTB design goal be dropped is a sound one.

11. If the problem generated by the UTB demise is understood to be the lack of sufficient "coverage" of intelligence targets, there are several straight forward ways of correcting the deficiency:

- a. If resolution can be sacrificed, the existing systems can be flown at higher altitudes to increase the "coverage." This solution seems repulsive from an intelligence standpoint, but from a system performance standpoint it should be noted that the J-3 Camera System has so exceeded its

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performance specification (180 l/mm actual vs. 110 l/mm spec.) that June 1965 expected J-3 resolution from the design altitude of 80 nm is now nearly achievable from operating altitudes of 100 nm.

- b. If peak performance from the system in a photographic sense is desired, the system should be flown at or near its design reference altitude of 80 nm. To meet the coverage requirements at this altitude more film must be recovered. This can be accomplished by flying more systems or recovering more film per system. More STB film per system could be recovered through the use of a larger supply cassette and increased capacity SRV. These modifications are more risky than the direct reorder of CORONA systems but could possibly be implemented with existing cameras, Agenas and boosters, thus providing an increase return in the 1971 time period.

12. My technical recommendations to you have not changed since December 1968. I recommend the conservative approach be taken, that STB be flown in the CORONA payloads and that sufficient additional payloads be ordered to cover the COMIREX search and surveillance requirements in the 1970-71 time period from an altitude of 80 nm. The availability of sufficient CORONA payloads to meet this condition

[REDACTED]  
I believe, that the photo reconnaissance programs are the wrong place for high risks to be taken in planning our intelligence collection.

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